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OBSERVATIONS UPON THE COMPARATIVE ADVANTAGES AND INCONVENIENCES OF THE EMPLOYMENT OF IRON WIRE, OR BAR IRON, IN THE CONSTRUCTION OF SUSPENSION BRIDGES OF GREAT SPAN.—*By M. Le Blanc*, Chief Engineer of Bridges and Roads.

Second objection.—The imperfection of the present process for manufacturing the cables does not allow of an equal tension in all of the wires, so that when the cable is raised to its place the wires under most tension are overstrained by many pounds, while those under the least tension do not draw at all.

This last objection is a serious one, and cannot be absolutely done away with, that is to say, it is impossible to prove that this defect does not deserve the most serious attention; but we can employ, in defence of iron wire, negative arguments, or in other words we can prove that it is not possible to resolve the problem of equal tension in a more perfect manner by the system of chains than by that of cables of iron wire.

We must in the first place distinguish carefully between bridges of large or small span; in the latter, where the tension requires only a section of the chains equal to that of 4 to 8 bars of about 0·05 metres to 0·06 m. in diameter, (4) (dimensions beyond which the quality of the iron becomes considerably deteriorated,) we can establish on each side of the bridge two or four separate chains in one or two layers, each chain being made of a single bar only; in these two cases the problem of equal tension is perfectly resolved, and although in the second each suspension rod bears upon two

(4). I reason on the supposition of the use of round iron, of which I need not prove the superiority over square iron, that is hammered again after being re-heated to a cherry red.

chains which cannot have exactly the same curvature, the holding plate of the rods will always bearm upon the two chains which will then support equally their share of the whole weight of the bridge.

By establishing three or even four layers, we can form an excellent system of sixteen chains, each made of a single bar, but these sixteen chains present only a total section of less than 44,000 millimetres corresponding to a tension of 352,000 kilogrammes, that is to say, to bridges of medium span, but if we pass to bridges of such a span that the tension increases to more than a million of kilogrammes, it will be necessary that the chains should be composed of forty-eight or even sixty-four bars—that is, 24 or even 32 bars on each side.

Let us consider the last hypothesis, which applies to the case of the bridge of Roche Bernard.

It is impossible to employ the simple system of suspension rods resting upon a couple of chains, of single bars, and arranged in layers, for we would then have 16 of these layers, one above the other, which, beside the inconvenience presented by a considerable height, would allow of the attachment of suspension rods only at every sixteen intervals upon the same chain.

Here then it is necessary to employ a more complicated system, namely to form the chains of several bars fastened together by a single bolt—in this case I would reduce the number of chains to eight, and form them of eight bars, fastened by one bolt(5).

We can double the number of chains and so reduce to 4 the bars in each, by making each rod rest by means of plates upon two chains at once, but if the two chains forming the couple are not in the same plane, the upper plate of the rods will bear only upon one of the chains—for it must remain parallel to the plane of the four bars—and one half of the system will support nothing: this disposition is too faulty to be adopted—this is my opinion in the hypothesis of eight bars to each chain and fastened by one bolt.

Whatever may be the manner of forming the eye at the end of the bar, either by welding it to the end itself, or by bending over a portion of the bar, it appears to me very difficult to prevent differences in length of at least a millimetre between the bars.

Now if there is this difference between bars, 5 metres in length, the shortest must lengthen a millimetre, or ·0002 of their length before the others draw.

But we know that a tension of two kilogrammes per square millimetre of section produces upon a bar an elongation of ·0002 of its length.

(5). I suppose it would not be desirable to employ more than four layers—this number is already considerable and troublesome in the passage over the towers and in the moorings.

The bars then of which we are now speaking, are strained to the amount of 4 kilogrammes (per sq. millimetre) before those beside them suffer any tension; what will this amount to if the differences in length are more than one millimetre?

We see then that the problem of equal tension is as difficult of resolution for a complicated system of chains as for iron cables, for supposing that in the two systems, the excess of tension, either of one wire over another, or of one bar over another, is the same, this excess will be a much smaller fraction of the absolute strength of wire than of bar iron; moreover, the manufacture of cables afford a greater hope of perfection than that of chains(6).

We see now that the second objection has no more weight than the first, to decide us in favor of wrought iron chains.

On the other hand, there are objections against the employment of bar iron more difficult to remove, and which will give additional strength to the reasons which have induced me to yield the preference to iron cables.

These objections are as follows:

1st. The greater part of chain bridges which have fallen have given way at the bolts which unite the links. Now it is extremely difficult to calculate the strength which should be given to them, as we do not perfectly understand the manner in which they resist the strain; if we compare them to bars placed upon fixed bearing points, and charged with a weight in the middle, and the resistance of which is derived from a formula $P=M\frac{ab^2}{2c}$, we find the dimensions very small, too small indeed, according to many expriments.

If we suppose them to resist as if drawn in the direction of their length, (and many constructors admit this hypothesis,) we arrive at large sections, which greatly increase the weight of the joint; besides this we have no certain information as to the quality of the iron which they need, it should not be so soft as that of the chains, because no curvature is required, but still it should not be brittle; to avoid mistakes prejudicial to the durability of the work, it is wise to make them rather too strong than too weak, but as I have just said, an increase of weight is the consequence of this precaution.

2nd. The making of the eye requires great attention; it has been observed that when the bolt is too little, during the proof, a rent takes place from the outside to the inside of the head of the eye;

(6). To make the bars as equal as possible, we can indeed, after having bent and welded the ends, drill through all of them which make up a link of the chain, when cold; but it is evident in this case, that to prevent the drilling from diminishing the strength of the eye, we must either give greater size to the bar in this part or flatten it, involving a heating which injures the quality of the iron.

when the bolt is too large the rent opens from the inside toward the outside. Now, as it is almost impossible that the work of man should be perfeet, in order to avoid the inconvenience above mentioned, several constructors have proposed to swell out the head of the eye in order to give it greater strength, but to do this we must re-disturb the particles of the iron by hammering after having heated it, an operation which I have already designated as faulty.

3rd. During the oscillatory motions, which take place in all suspension bridges, the irons rub forcibly against each other at all the joints, and this tends to wear them in those parts which have the greatest strain. This inconvenience does not exist in wire cables.

4th. In the moorings we are compelled to use curved irons, which have of course been re-heated and are most often squared, this new heating, and the difficulty of proving them, obliges us to give a greater size, which involves another increase of expense(7).

5th. In very cold weather iron becomes brittle; wire enveloped in grease and not in immediate contact with the air, must be less brittle than naked bars of iron.

6th. Cables in bridges of great span, can be much more easily raised to their places than chains. In the proposal for the bridge of Roche Bernard, I have calculated that the weight of a cable would be 7,968 kilogrammes, while each chain would weigh 31,496; a work equally difficult it may be said, has been executed at the Menai bridge, but if this proves that it is not impossible, it does not prove that it is not very difficult.

M. Vicat has asserted that wires before breaking, suffer a considerable elongation, which announces the rupture beforehand, and thus gives time to make the necessary repairs, while chains break instantaneously.

This advantage of iron wire has been disputed in the case of wires united in bundles by ligatures, and the interstices of which are filled by grease; M. Frinot thinks that these bundles form a brittle system; he doubtless would like to say, as brittle as bar iron. In support of his opinion he has cited the *herse*, a sort of skein of hempen thread, which has most strength when its elements are free, and looses part of it as soon as the loose threads are bound together, and approximated to the condition of ropes; if this assertion is confirmed by experiments, and I have prepared some for this

(7). There are, for instance, some red shear (hot short) irons which loose nothing by being wrought at a white heat, but which are injured in quality when wrought at a less elevated temperature. But the workmen cannot confine themselves to fulfill these conditions exactly, whence it happens in irons, which have even been proved, that the re-forged portions become bad, and consequently that only the final proof can give evidence of this imperfection, but as we have just said, it is very difficult to prove curved bars.

purpose, cables will in this point of view, be neither worse nor better than bar iron(8).

Third objection.—Cables form a less rigid system than bars of wrought iron, so that the horizontal vibrations of the roadway are much greater in the former than in the latter.

For equal curves and weights this is true, but when we have once given the preference, even in point of durability, to wire over bar iron, (and I confess I have done so,) will we not gain more by increasing the rigidity by means of the greater weight of heavier timbers for the roadway, and by diminishing the curvature of the cables, or the tension which they should bear per square millimetre of section—than by substituting chains for cables?

These latter likewise admit of an arrangement which cannot be adopted for chains. I refer to the cradle form, and in this case the outside cables being in a plane, inclined from the vertical, have a tendency to draw the whole roadway towards them, and as this takes place on both sides, it follows that the roadway is kept in its position better than it would be by means of stays.

I offer these reflections to the readers of the *Annales*, as the result of perfect conviction, in my own mind, after deliberate consideration, and I can indulge the hope that this conviction will be shared by at least a small number of my associates. I shall examine in a subsequent article the advantages and inconveniences of a diminution of curvature, and the defects in the proof which chains and cables undergo either before or after being placed.

We beg leave to call the attention of our readers to the announcement on our cover, of the publication of a work entitled "*Sketch of a Railway, judiciously constructed between desirable points.*"

This volume contains the largest body of Railway statistics ever collected in the same space, and possesses this advantage, it is expressly calculated for the wants of our own country, while the whole railway experience, both foreign and domestic, is brought to bear upon the present state of public improvement.

This work has been prepared by one of the most zealous friends

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(8). M. Launaut recently attended to the work of the bridge of Roche Bernard, has given me some details in regard to the *herse* which can explain the objection of M. Frimot. The *herse* is made by laying the threads in a circle, and if they are perfectly parallel and evenly stretched, the inside ones are shorter than those outside; if ligatures are applied, and the *herse* is drawn out as it must be to lift or pull loads, we see that the threads of the bundle which from being circular are now straight or even bent in opposite directions—the outside threads then must be thrust up together, while the inner ones, if they do not stretch, must break; without the ligatures there would be a compensation between this lengthening and shortening, so that they actually injure the strength of the bundle, but it is the change of form and not the ligature which is the cause of the evil, and the *herse* bound, or not bound, would have the same strength, if it retained its primitive form, as is case with cables of wire.

of internal improvement in the United States, who has with unwearied diligence and scrupulous accuracy, collected and prepared whatever could be found upon the subject.

The peculiar position of affairs at the present day is bearing with increasing effect upon the subject of railroads as a means of national convenience and private investment. A real service is therefore rendered to the community by the writer of this volume, to whose correctness and knowledge of the subject we most cheerfully give our testimony.

As a manual of information, this "Sketch" should be in the hands of all interested in public works.

We give the following abstract of the notes which will convey to the mind of the reader a very fair idea of the extent and variety of the matter treated of, and at the same time place at once before him the result of some of the more important calculations.

ABSTRACT OF POINTS, ILLUSTRATED BY THE NOTES.

As the notes in fact contain the real matter explanatory of the railway in itself, and as it compares with the canal and navigable river, a ready reference to each particular point explained by them, will be most likely to attract by not wearying the attention of the reader on this dry but important subject. The following abstract is to effect that object, and being enabled to get at once to any one point of particular interest, his curiosity may be further aroused and quickened into a gradual examination of them all. He will then be able to judge what little foothold of truth, the present condition and future prospects of the railway, can yet have in the public mind, and how much it needs investigation. Our present attempt is not offered as anything more than an INDEX by which that desirable object will be assisted and promoted, and it will have answered its purpose, if it but lead others to an abler and fuller exposition of the subject.

In impugning any of our statements, care only must be had, not to be misled by single instances of opposite results, and to be sure that the things compared are alike, as our positions are founded on the working of a *modern road with modern equipment*, to which those of older date have but little or no analogy. The variance in working different roads may be recalled to the reader by the two extreme cases before cited by us.

Georgia R. R. 105 ms., did its business in 1840 for 60 cts. pr m. run.
Bos. and Wor. 45 ms., " 1839 for $2 "

And why this difference? Because the first is of the most economical length, the price and quality of fuel south, puts the motive

power at half cost nearly, and slave labor is also cheaper. Thus will every road vary, one way or the other, and 75 cents per mile run, may be taken as a fair average, to cover all expenses, save interest on capital. No road will be found to fall more under that average than the Philadelphia and Pottsville.

1. Oliver Evans in 1789, and Col. John Stevens in 1812, were among the first to direct their attention to railways in the United States.
2. The performances of several locomotives, given to show their power on a level, to be equal for 11 ton engine to a gross load of 500 and a nett load of 300 tons. Also a calculation of expense, running a locomotive between Philadelphia and Pottsville with her train of 50 cars, or for 100 miles, which can be made to apply to any road.
3. The power of a locomotive of 10 tons, equal to 230 tons gross or 152 tons nett load over a grade of 19 feet per mile.
4. The expense of greasing car wheels about 1½ cents per ton for 188 miles, a mere fraction at any rate.
5. The general expenses, as estimated for the Philadelphia and Pottsville railway for motive power and freighting, as originally made, shown to have been full high by the experience on the road itself.
6. Showing that if the charge for carriage of a passenger is $3, and that for a ton of coal $2, yet that the latter is the more profitable business, there being 20 tons of coal to carry at the saving speed of 10 miles per hour, for one passenger at the *expensive* speed of 20 miles per hour. Reasons why coal has never yet been carried over a certain limit of distance, and on the folly in consequence, of restricting the practicability of carrying it to that limit.
7. List of sundry improvements in different States, showing a wasteful and unnecessary expenditure. On the necessity that canals are under to carry at rates below the cost of transportation on them, and on the false impression thus created of their being cheaper carriers than railways.
8. The leading railways, such as the Camden and Amboy, Philadelphia and Baltimore, and Columbia, exhibited in the light in which they would appear if divested of the extraneous causes which now diminish their success.
9. The just weight of iron rail yet undetermined, the adequate mean seeming to lay between 50 and 60 lbs. per yard. The greater power of the locomotive on an edge rail, and the saving thereby in general wear and tear, as compared with a flat rail.

10. The travel on the Philadelphia and Pottsville railway likely to be considerable, if the policy of making a *focus* of it by low fares be adopted. Pottsville should be to New York for *fuel* what Albany is to her for *bread*, and she is equally interested with Philadelphia in a cheap and quick avenue to that point.
11. The fitness of the railway as now constructed to carry *freight* advantageously, proved by experience in this country and in England.
12. The advantage which *long lines* of railway afford in economy of management and general profitableness as compared with short ones.
13. The proportion of expenses to the gross receipts given from several roads. The views of the monied circles in England as to the security of railways for investment as given in the Banker's Circular. Table of the business loads carried over certain grades, with the approximate cost of transportation on each per ton for 100 miles.
14. That canals as carriers are cheaper, or are less expensive to maintain than railways of the present day, shown to be untenable, and that the reverse is true. A statement of fares by steam power contrasted with those by ordinary means, to show that the former are cheapest and prefered at much higher rates.
15. The connection to be formed with the New York improvements at Elmira will bring the far western and northern travel through the valley of the Schuylkill as the nearest route to the sea board, and the importance of this union alluded to by the Governor of Pennsylvania in his message of this year.
16. The great capacity of the railway for business in freight and travel, shown by the Stockton and Darlington, being principally a coal railway. A suggestion as to the most economical mode of transporting large amounts of tonnage, by distributing it as near as practicable through the different months of the year. On the advantages of low rates of fare and freight in England and on the continent.
17. The prospect of a great extension of the iron trade in the Pennsylvania coal regions, of which the vent must ultimately be the valley of the Schuylkill. The cost of manufacture, etc., at Pottsville.
18. The rapid strides in arts and mechanic sciences, all over the world, warn us not to fall *behind the times*, but to follow up the experience of the day, always eliciting something useful. Exemplified by the notions entertained of railways, especially in the State of New York in 1835, and what they are at the present day.

19. The question of grades as now viewed in England, much changed of late by the improvements in motive power, 40 to 60 feet to the mile being no longer considered any great obstacle in attaining the requisite speed.

20. Showing the termination at Richmond, above Philadelphia, of the Pottsville railway, to be the best site for a National Foundry.

21. A list of expenditures on a canal, to show the numerous occasions thereof. Large annual appropriations required for the canals of Pennsylvania, with some reflections thereon.

22. The first impression as to the comparative expensiveness of the railway shown to be an erroneous one. The sills and bridges for instance are set down as costly to renew, but this is not found to be so when examined, and so on throughout all the other items of expenditure in the comparison with those on a canal as per sample given in note No. 21. The wooden portion of the railway likely to become cheaper hereafter, by the substitution of coal as a fuel.

23. The wastage on the coal during its long passage down the Schuylkill canal apparently irremediable, and only to be cured by its *quick* transit over the railway.

24. The freighters or boat owners on the Schuylkill canal, having no concern therein, will find and of course follow their own interest in transferring themselves to the Delaware for the export trade, for which they would be principally wanted.

25. Showing the constantly onward progress of the railway, that they have about doubled their business in five years. A statement of the great success of the Utica and Schenectada railway given, being a model for judicious and economical management.

26. The duty of government is to foster and encourage railways, as we find is the case in England and on the Continent, and that they are least of all objects for taxation. The sooner we can bring this improvement to be held in equal estimation among us, the better, and this can be done only by first understanding and then patronising such railways as the Philadelphia and Pottsville, and other standard works.

27. The current high prices of coal during the cold months, and the suffering thereby, to be only remedied by a railway to the Delaware, when instead of fluctuating from 7 to 8, it will be steady at 5 to $6 per ton. Some statistics respecting bituminous coals, foreign and domestic given.

28. On the rapid extension of the railway system in the last ten years, and on their relative costs here and in England.

29. On the importance of the Schuylkill region maintaining its ascendency in the coal trade, secured to it by the cheaper rates of transportation by railway and canal, from that region, as per details given in regard to the mere cost of delivering white ash coal in New York. The valley of the Schuylkill, is likely the soonest to require both these means to discharge its trade.

30. Facts in regard to the New York and Albany railroad, showing its ability to compete in travel with the Hudson river, far more curious than the Philadelphia and Pottsville railway pretending to vie with the Schuylkill canal. Comparison of cost per mile of running a steamboat and a railway train, being less by the latter.

31. The collateral advantages of the railway, more particularly appreciated in Massachusetts. Estimated to save three-fourths of the cost of transporting persons and merchandize in that State.

32. Facts in regard to the New York and Erie railroad, illustrates the advantages of long lines, with other statistics in regard to the relative costs of transportation to the lakes by canal and railway, the latter being able to carry *under the cost of freight alone* by canal.

33. The safety of railway travelling now fully established and of which there is daily proof.

34. Showing the hostile interest opposed to the Philadelphia and Pottsville railway, the consequence only of those rivalries which beget all improvements—and noting two of the latest, as affecting the economy of railways.

35. Statement of the Columbia railway: an attempt to unravel its management, and that if this could be got right it would be profitable. It is now working under better auspices.

36. New Jersey railway, showing its large *way travel*, and its success in competing with the steamboats to New Brunswick, the latter charging 12½ cents and the railway 75 cents. A misfortune that it is not a continuous line to Philadelphia, where it could so easily deliver the traveller in 4 hours.

37. The Ericsson Propeller. Its probable use on canals and rivers.

38. Reasons for the General Government, through the Post Office, assisting the carrying out main railways, as part of the system of aid proposed to be given to ocean steamers. On their moral influence, etc., etc.

39. Hasty and unfair judgments passed on railways, without discrimination of the bad from the good. A new era coming in railways, when their security and usefulness will be better appreciated by the capitalist.

40. On the freshets of the Lehigh and Schuylkill rivers, and the

complete security of the Philadelphia and Pottsville railway against the latter.

41. On the want of a unity of connection on the line between New York and Philadelphia, and on the advantages of making *one efficient line* between the two cities with suitable terminations. The specimens of the good and bad abound on this line, and if properly studied, are sufficient to enable the student in railways and canals to acquire a perfect knowledge of the subject.

42. A comparison of the cost of several roads, as illustrating the comparatively moderate cost of the Philadelphia and Pottsville railway. On the progressive character of the railway as compared with the stationary one of the canal. The advisableness of aiding poor inventive talent by government, or at least that it should not be subject to any expense for patenting its products.

43. Further evidence of the onward progress of railways—and also a more extended notice of the Great Western Railway from Boston to Albany. See map attached to note No. 30, showing line of and connections with this road; also the position of the canals which have been superseded by railways referred to in note No. 14.

44. Statement of the produce which reached tide water through the New York canals in 1840, and the States from whence it came, in part. A condensed view of the expenses of all the New York canals for 1840, and a sketch of the resources of the State of Pennsylvania.

[For the American Railroad Journal and Mechanics' Magazine.]

Sir—In Moseley's Illustrations of Mechanics, edited by Prof. Renwick for the School District Library, I find the following note on the Fribourg Suspension bridge.

"The bridge of Fribourg is said, however of late, to have become unsafe. If this be the case, it is probably owing, not to a want of tenacity in its materiel to resist the *ordinary* strain upon it, but to the impulses of *vibratory* motion to which, from its lightness, it is liable in high winds, or from the rapid motion of vehicles."

This note appears to belong to the author of the work. As no authority is given, and in the statement itself a doubt of the fact seems to be implied, it will not be proper to reason on the premises.

Can any of your contributors or readers give any information on the subject? As far as I can recollect no mention of the unsafeness of this work is to be found in any of the foreign journals.

Should any one communicate the desired information it would greatly oblige the writer. X.

[For the American Railroad Journal and Mechanics' Magazine.]

The public have lately been indebted to you for putting forth a work entitled "Sketch of a Railway, etc.," which, at least in my case, has relieved my mind of much erroneous impression, replacing it by quite a favorable view of that species of improvement.

Your Journal of 1st February last, in an article on the three great Railway lines to the Upper Lakes from the city of New York, had led me into the agreeable delusion, that our emporium, in proximity to them, had the decided advantage over all her sister cities. But all this has been dispelled by note No. 15 of this Sketch, which shows that Philadelphia is nearest the *fountain head* of the immense traffic and travel of the said upper Lake region by some 180 miles —thus

Cleveland to New York by lake Erie to Dunkirk, and thence by railway to New York, - - - -	654 miles.
Cleveland to Philadelphia by railway, (Mr. Schlatter's middle route,) - - - - - - - -	478 "
	176 miles

nearer to Phiadelphia, besides being a continuous railway, with lower grades than the Erie and New York railroad, which will also be tapped at Corning or Elmira, diverting a portion of the northern lake travel towards Philadelphia as nearest the seaboard from those points, and this line passing through Pittsburg, brings her also nearest to the valley of the Ohio and Mississippi. After the many disasters in crossing the lake from Buffalo, who would add to his fare by that route, the expense of a *life preserver*, when, supposing the above middle route completed, he could go direct with *perfect safety* in *half the time* and at *half the expense* from Philadelphia, which as the cheapest point for fuel, would then seem only to want one or two smart ocean steamers to give her the complete preponderance in all but foreign commerce.

The discovery of this "middle route" is well for Mr. Biddle, as it more than confirms his assertion made at the Williamsport Convention in 1838, of Philad. being nearest to the trade of Upper Lakes, (Erie, St. Clair, Huron and Michigan,) and nothing but the temporary hampered state of the finances of Pennsylvania, can retard her moving at once to secure such a prize. It is a curious fact that this State, which, up to 1830, was behind New York in her ratio of increase in population, is shown by the census of 1840 to have outstripped her, the per centage for New York being 26¼ and that of Pennsylvania 28, for the last 10 years. What an acceleration to

her progress would the connection by railway with Cleveland be!!

If we can ever be made to move, in New York, to connect our city with Albany by railway, we may hold on to the entire northern and Ontario lake trade, with Oswego as the outlet, distant 315 miles from New York—otherwise Boston will do much in sharing it with us, which we could but ill-afford with this prospect of losing the best portion of that of the Upper Lakes.

All we now need to complete our misfortunes, is to persist in the enlargement of the Erie canal, while we ourselves, as well as our neighbors, are constructing railways which will supersede it—but in the hope that wiser counsels will prevail in our next Legislature,

I am your very obd't serv't,

New York, August, 1841. Y. X.

For the American Railroad Journal and Mechanics' Magazine.

WEEKLY RAILWAY RECEIPTS AND PRICES OF STOCK

of the four principle railways in England, received by the last steamer, from 24th to 31st July, calculated at $5 per £1 Stg.

Name of Corporation.	Receipts per week.	Paid in per share.	Present price.	Dividends.
Grand Junction,	$50,225	$500	$1,000	13 pr. ct.
Great Western,*	70,980	325	420	1½ "
London and Birmingham,	95,845	450	800	8 "
Liverpool and Manchester,	32,000	500	1,005	10 "

It would thus appear that the march of railways is onward. The day is not distant, when railways in this country, on main lines, "*judiciously constructed between desirable points*," will be sought after, by our capitalists with more avidity than they subscribed to safety fund bank stock, during the years 1835. '36, and '37, and we predict that this class of investment, will be considered as secure as productive real estate, and will have the preference over investments in bank stock generally in the United States.

It is true, that in this city, our capitalists in their first investments on *short* lines, costing two, three, and even four prices, from injudicious managements, are timid in touching railway stock, while the capitalists of Massachusetts have invested near twenty millions of dollars, in this better improvement of the age with 7 pr. ct. profit.

We have long viewed with surprize the appathy of our citizens, in the prosecution of a railway on the most *direct route* to Albany and Troy. It would appear, they are content with every charlatan,

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* Just completed, carried 42,397 passengers the last week in July.

who will propose to build "*a temporary cheap road*" for them, even where it will advance rival interests.

How long will this continue? Can there be a question that a line of railway extending from this island to Troy, with 400,000 inhabitants in this city and its vicinity, connectiug as it will with upwards of 500 miles of railways in manufacturing New England, with a continuous line from Albany to Buffalo, and branches to Whitehall and Oswego, to connect with Upper and Lower Canada, can fail to pay a handsome dividend to its stockholders? We would further ask, can there be a railway constructed in the United States, [where freight and passengers are combined.] that will pay as well as a good *solid railway* from New York to Troy, on which 30 miles per hour should be accomplished, with certainty and regularity? With this speed, or 25 miles per hour, the *business*, and a large portion of the pleasure *travel*, will seek the railway, in preference to the river. All the valuable merchandize, at a speed of 10 miles per hour, will be placed on the railway, for certainty and regularity of supplies to customers, at all seasons, and to keep up with the onward march of improvement.

We reiterate the sentiment expressed on a former occasion:—"*railways are destined to change the entire course of business and transportation.*" The city of New York must not fold her arms under the belief, that she is secure, and that with the North river and Erie canal, she can maintain her commercial superiority over her neighbors. J. E. B.

IMPORTANT DECISION of the Vice Chancellor of the first Circuit of the State of New York in relation to fences and cattle yards upon railways.

BEFORE THE VICE CHANCELLOR:
In the matter of the Long Island Railroad Company
and
Alexander McConochie.

This matter coming before me on the annexed report of appraisers, and Alexander McConochie, the land owner, being dissatisfied with the allowance of one hundred dollars for his damages "without reference to fence," I appointed the 30th day of July, 1841, for the parties to appear before me at the court room of the court of chancery in the City Hall of the city of New York, then and there to produce their witnesses and proofs touching the use of "Cattle Guards," so called upon railroads, and the sufficiency and safety of such guards or barriers, instead of side fences along the line of the railroad so as to dispense with the necessity of making such side

fences; and if side fences are indispensable, then touching the cost of making and maintaining the same where the railroad in question passes through the land of the said Alexander McConochie, and by such evidence to enable me to determine the question concerning fences, and to modify the assessment of the appraisers by allowing to the said Alexander McConochie an additional compensation, or not as should appear to be just—at which time and place the parties appeared before me—the Long Island Railroad Company by George B. Fisk, their President, and Alexander McConochie by Mr. McVean, his counsel, and on the part of the company, James J. Shipman, John Leach and John Sutphen, were sworn and examined as witnesses; and on the part of Mr. McConochie, Smith A. Parks, Luther Loper, Jarvis P. Whitsen and Lorenzo Walters, were sworn and examined as witnesses; and the substance of the testimony as taken down in writing by me is containod in the schedule annexed.

From the testimony of Shipman, Leach and Sutphen, and from an inspection of the model exhibited, I am perfectly convinced that "guards" properly constructed across a railroad, are effectual barriers to the passage of horses, cattle, sheep and swine, along the track, or within the lines of the road: and when connected, as the guards must be, with the *exterior* fences of a farm, or with the *interior* division fences of fields crossing the road, or any partition fence between owners of adjoining lands intersected by the railroad, they will as effectually prevent the ingress and egress of cattle or other domestic animals, as the best of farm fence will do. It is true that animals will not thereby be prevented from passing over the road, from one side to the other, nor along the road between any two of the guards, and where this may happen in any enclosed field, it can only so happen with the cattle or other animals of the owner of the field which he may turn or suffer to run therein. By laying a railroad through an enclosed field, may not deprive the owner of the opportunity or advantage of using the land on both sides in common as one field at the same time, either for tillage or pasturage—all that he may require, will be the privilege of crossing the railroad from one part of the field to the other, (and this privilege to Mr. McConochie the Railroad company avow themselves ready and willing to give). If the railroad should cross the field in a deep cut, or upon any considerable embankment, then indeed, the land owner may be put to great inconvenience, and perhaps be entirely prevented from crossing for ordinary farming purposes. But it does not appear that this

will be the case with Mr. McConochie; and for whatever inconvenience he may be subjected to in this respect, or from the manner in which his land may be cut up, and his fields disfigured by the making and running of the road, as well as for the real value of the land taken, I must suppose the award of one hundred dollars is intended as full compensation. This sum is not objected to on the ground of its insufficiency to cover the value of the strip of land, and all such consequential damage, if any such there be. It is only insisted that Mr. McConochie is entitled in addition, to have fences erected along side of the railroad where it runs through his land, at the expense of the Company.

I am of opinion that such fences are not essential to the ordinary use of the farm in any branch of husbandry, and for these purposes that the construction of "cattle guards," wherever the exterior and interior fences of the farm intersect the road, will afford all the protection which may be necessary against the egress and ingress of cattle, etc., to and from the highways, the adjoining fields or other contiguous lands, and therefore Mr. McConochie is not entitled upon any such view of the case, to have fences (other than the cattle guards) erected in whole or in part at the expense of the Company.

I am also well satisfied by the testimony of the witnesses who speak from what they have seen and experienced on this and other railroads a number of years, that it is not necessary a railroad should be fenced at the sides to insure the safety of persons and property in transit on the road against accidents from cattle, etc. Indeed it is very clearly to be perceived that there is less danger of running over them, when they do get upon the road where there is no side fence to prevent their going off, than where there is such an obstruction.

The law of self-preservation, creating fear or the dread of danger, and a disposition to avoid it, operates upon the animal instinct, and impels them naturally to diverge from the course of the road, and if a fence is in their way, it serves, in the language of one of the witnesses, as a foil to turn them back upon the road, and it is only in such parts of the road as are fenced, that accidents of the kind happen.

But notwithstanding these facts, it is urged as a matter of *legal right* in the land owner, to have his lands adjoining to a railroad running through them, separated therefrom by a good and sufficient fence, to be constructed at the expense of the company in the first instance, and afterwards to be deemed a partition fence, as be-

tween owners of adjoining lands. This is the point I have now to consider.

In the case of the Rensselaer and Saratoga railroad company, (4, Paige's rep. 553,) the Chancellor speaks of an owner of land through which a turnpike or a common highway is run, being obliged from *necessity*, to make the fence along such roads to enclose his lands, (unless he is willing to leave his land open as a common,) the turnpike company or the public having no interest to keep up such fences for the sake of the roads, because the running at large of cattle upon them cannot materially interfere with the travel and ordinary use thereof, and in such cases the land owner being compelled to make fences, which, but for the laying out of the turnpike or highway, he would not be obliged to make, is entitled to full compensation for the expense to which he is thus subjected. And the counsel in argument before me insist that the evidence which proves there is more safety from cattle on a railroad when it is unfenced at the sides than when it is, only shows that the railroad company then has no interest to keep up such enclosures, and places such road upon the same footing as a turnpike or highway, and subjects the company at once to the liability in such cases pointed out by the Chancellor.

I cannot agree with the counsel in this supposed analogy, or in the application of that principle.

A railroad is not, like a common highway or turnpike intended for general travel and the passage of all sorts of cattle; it can only be used as a particular mode of conveyance for passengers and goods; it admits of *barriers* placed wherever needed, to obstruct the passage at those points of every thing except the moving power and its train; and when it runs through the land of an individual, it does not lay open and expose the land and growing crops to injury as from a common travelled road.

The Chancellor further observes, that the manner in which a railroad is to be used renders it *necessary* that the company should *secure* their road against the encroachments of cattle, etc., from the adjacent lands, to *ensure the safety* of the persons and property of those who may pass upon the road, and he considers that the obvious means of doing this is by fences. It has already been shown from the evidence before me, that this *security* can be attained better without longitudinal fences than with, unless indeed fences should be so strongly and durably built as to be completely *cattle proof*. What are deemed "*good* and sufficient" fences among farmers, for all ordinary purposes, it is very evident do not always prevent cattle from getting on the road. How often are fences broken

or thrown down by cattle, which officers of the town, called *fence viewers*, adjudge to be good and sufficient, so as to justify the distraining of the cattle *damage feasant* for the trespass? Such cases do occur, and they show that a *good and sufficient* fence in the law, is not always capable of restraining cattle.

A railroad company could not be required to put up or pay for any other than an ordinary farm fence, and such, it is shown, do not afford the degree of security required. They had better then be dispensed with, and the road be left to that sort of security which consists in cattle having free and unobstructed egress from the road when alarmed, as they are sure to be by the approach of the engine.

Then if the Long Island railroad company have no *interest* in supporting fences for the *protection* and *security* of their road, upon what principle can Mr. McConochie call upon them to contribute to the making of such fences?

It is only upon the ground of *mutuality* of *benefit* that the equitable claim of contribution is founded, and it is upon that principle, the Chancellor held in the case as it stood before him, that the Rensselaer and Saratoga railroad company being as deeply interested as the land owner in having partition fences, was bound to make one half, etc. But when that mutuality of benefit does not exist, or either party chooses to forego it, and to dispense with an enclosure of his lands, no just claim of that sort can arise.

By this proceeding to take a strip of land for the use of the Long Island railroad, the company become vested with the title as owners and proprietors of the soil, and between them and Mr. McConochie, it becomes a case of ownership of adjoining lands. At common law no man is bound or can be compelled to enclose his land—he may in the freedom of his will leave his lands open and unenclosed by any fence, and at the same time use them for tillage, pasturage, or in any other way that he best can; being responsible for any injury his beasts wandering from his land may occasion to others, and entitled to an action for any voluntary trespass which may be committed upon him. (1, Cowen's Treatise 381). And the statute law of this State in relation to "Division and other fences," (1 R. S. 353, sec. 30,) expressly recognizes the right of an owner of lands adjoining to anothers, to let his lands lie open; and so long as he chooses to do so, no obligation rests upon him to contribute to the division fence which his neighbor may think proper to erect between them.

It is only when he encloses, so as to take to himself some benefit

of the fence along the division line as a part of the enclosure, that he can be called upon to pay for one half of it: and why does not this law apply to cases, like the present? I am at a loss for any good reason why it does not. The Chancellor considered that this 30th section of the statute did not apply in terms to *railroads*, because he says, the lands of the railroad company are not in fact enclosed at those points where the road is crossed by the public highway. It is very evident this was said with reference to the liability imposed by the statute to contribute where lands are enclosed, but it has no reference to the exception at the close of the section recoguizing the privilege of leaving lands open and unenclosed.

This case I think is taken out of the operation of the decision made by the Chancellor, so often referred to, by reason of the facts which are in evidence before me, in relation to the utility of "cattle guards," and the *security* of the railroad without fences, which experience has verified since the Chancellor's decision was made, and it follows, that so long as the railroad company choose to leave the road unfenced at the sides, they cannot be called upon to do any thing towards fencing it by the adjoining owner. But should the company hereafter find it necessary for their own interest or convenience to have the road enclosed, they will then bring themselves under the statute and be compelled to make or pay for the making of one half thereof. And should there be any town law, or regulation adopted, (if any such there can be,) under the authority of the statute conferring powers upon the inhabitants assembled in general town meeting, requiring partition fences to be made at all events between the railroad and the lands of adjoining owners, then the company will be bound to conform to such regulation, provided it be lawfully binding upon them.

I must allow the report and assessment of the appraisers to stand without any modification or amendment, except in the order confirming it to enjoin it as a duty upon the Long Island railroad company to construct at their own expense proper and sufficient cattle guards across and upon the road, wherever it intersects the exterior boundary lines of Mr. McConochie's land, and the interior division fences thereof, upon the plan of the model exhibited, and that the company continually hereafter keep up and "support those guards or barriers in a substantial and durable manner; and that the company moreover grant to him and his assigns, the privilege or easement of crossing the railroad at such and so many places as he may designate on his land, for the convenience of farming thereon, and that the company prepare and make those crossing places at their own expense. (Signed) Wm. T. McCoun, V. C.

August 7th, 1841.

[To the Editor of the American Railroad Journal.]

The great interest which is attached to every thing entering into the construction of railroads, has induced the undersigned to give publicity through the medium of your valuable Journal to an invention whose importance, by many competent judges, has been deemed to be great. This invention is a cast iron rail of novel form, cast entire in lengths of 10 feet, and which, if brought into general use, will effect a great revolution in the construction of railroads. But before proceeding to a minute description of the plan, your attention is solicited to its general features, with their attendant advantages.

The foundations are intended to be of oak piles from 11 to 17 inches diameter, (stone blocks with cast iron standards fixed upon them to support the rail at a proper elevation, would be as effective on graded roads,) driven at distances of 10 feet from centre to centre, longitudinally, by steam pile drivers, similar to those now in use on the Susquehanna division of the New York and Erie railroad; the hammer weighing 1200 lbs., and falling through a space of 28 feet, forces the points of the piles to a depth of about 5 feet below the surface of the soil, thus protecting them from the action of frost, and the superstructure from that destructive disarrangement, always consequent upon the breaking up of winter in our northern latitudes.

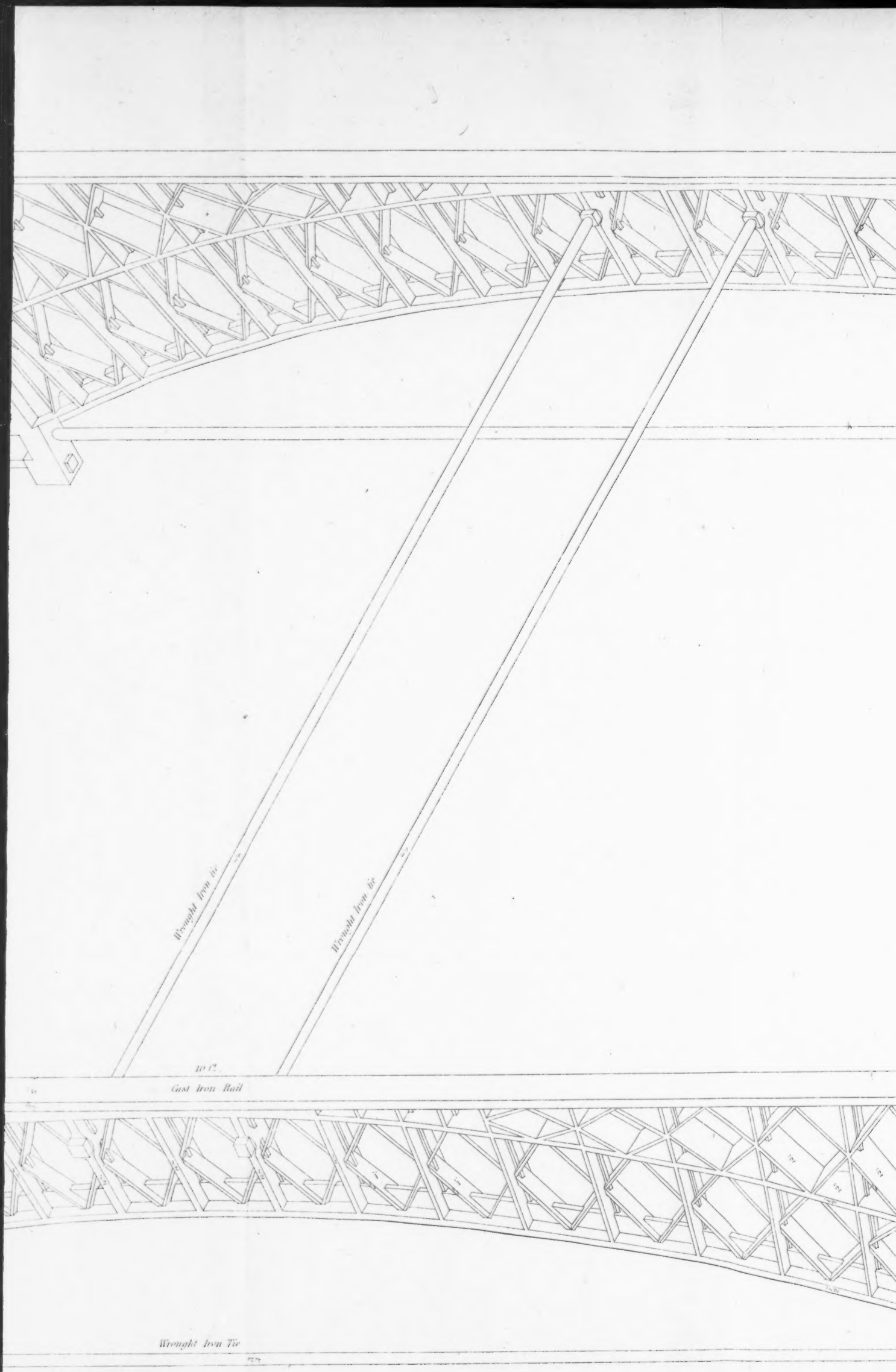
Another cause of disorder is avoided; that of the liability of the mud sills to settle unevenly as has been observed to be the case on all roads of the old construction.

Great economy will at once be perceived in the adoption of this plan, for by a skilful adaptation of the grade line to the surface of the ground, the top of the rail being elevated 1½ or 2 feet above it, a great outlay otherwise required for excavation, embankment, and ditching, will be saved.

In cases where marshes are to be crossed, the piles when they are driven to the surface, are succeeded by others dowelled upon their heads, until a sufficiently firm foundation is obtained. The superior advantages of this method are by no means speculative, for it has been used on the Utica and Syracuse railroad to the entire satisfaction of that company. The Susquehanna division of the New York and Erie railroad, for a distance of 109 miles, is being constructed on a similar foundation, as well as many other portions of that magnificent work.

With regard to the durability of the piles, observation has made known the fact, that sticks of oak of the before mentioned diameter, exposed to the action of the weather, will remain sufficiently

Chair
White Oak Tree
11' to 16' Diam.


Wrought Iron tie
Wrought Iron tie
Cast Iron Rail
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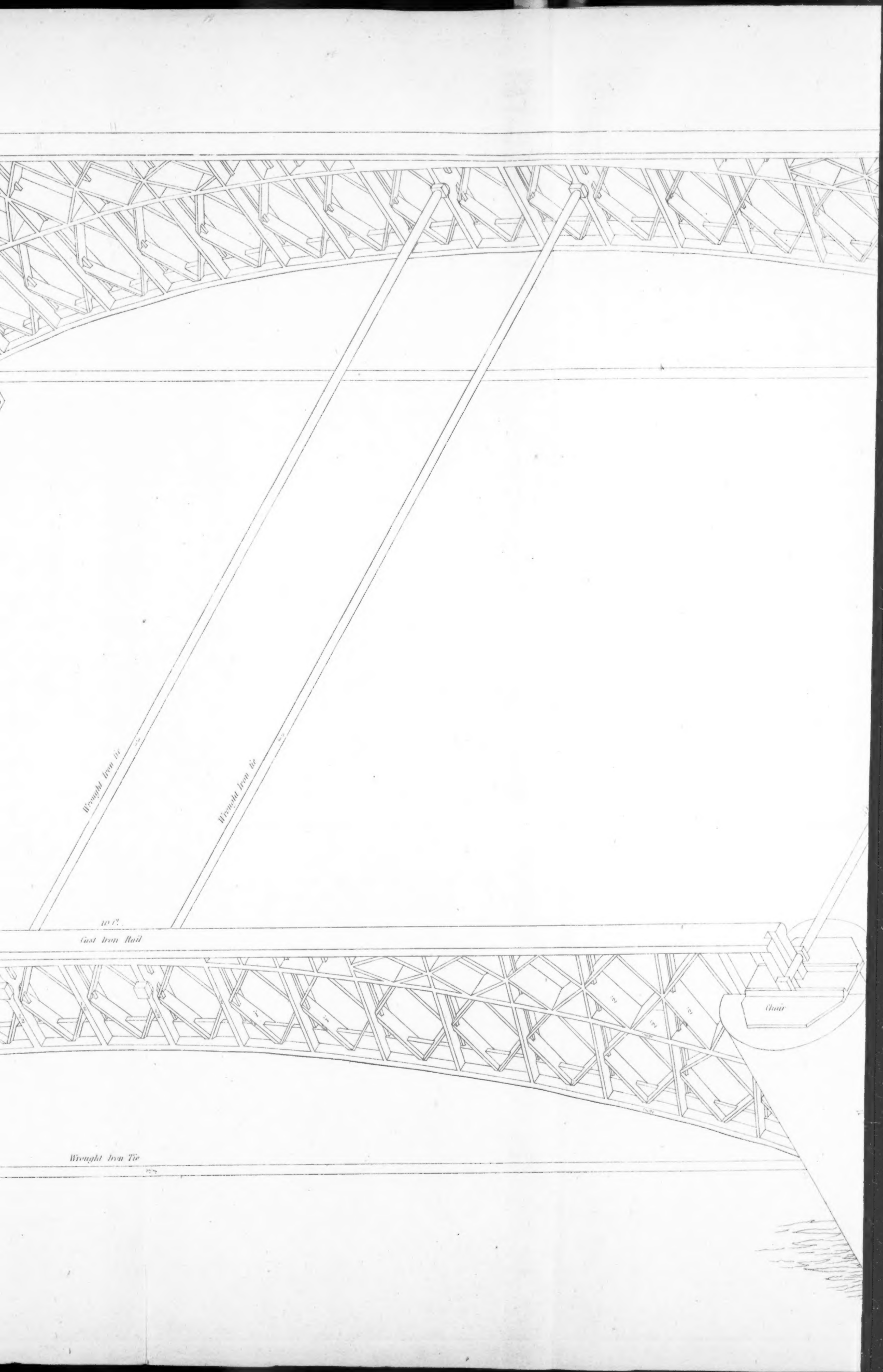
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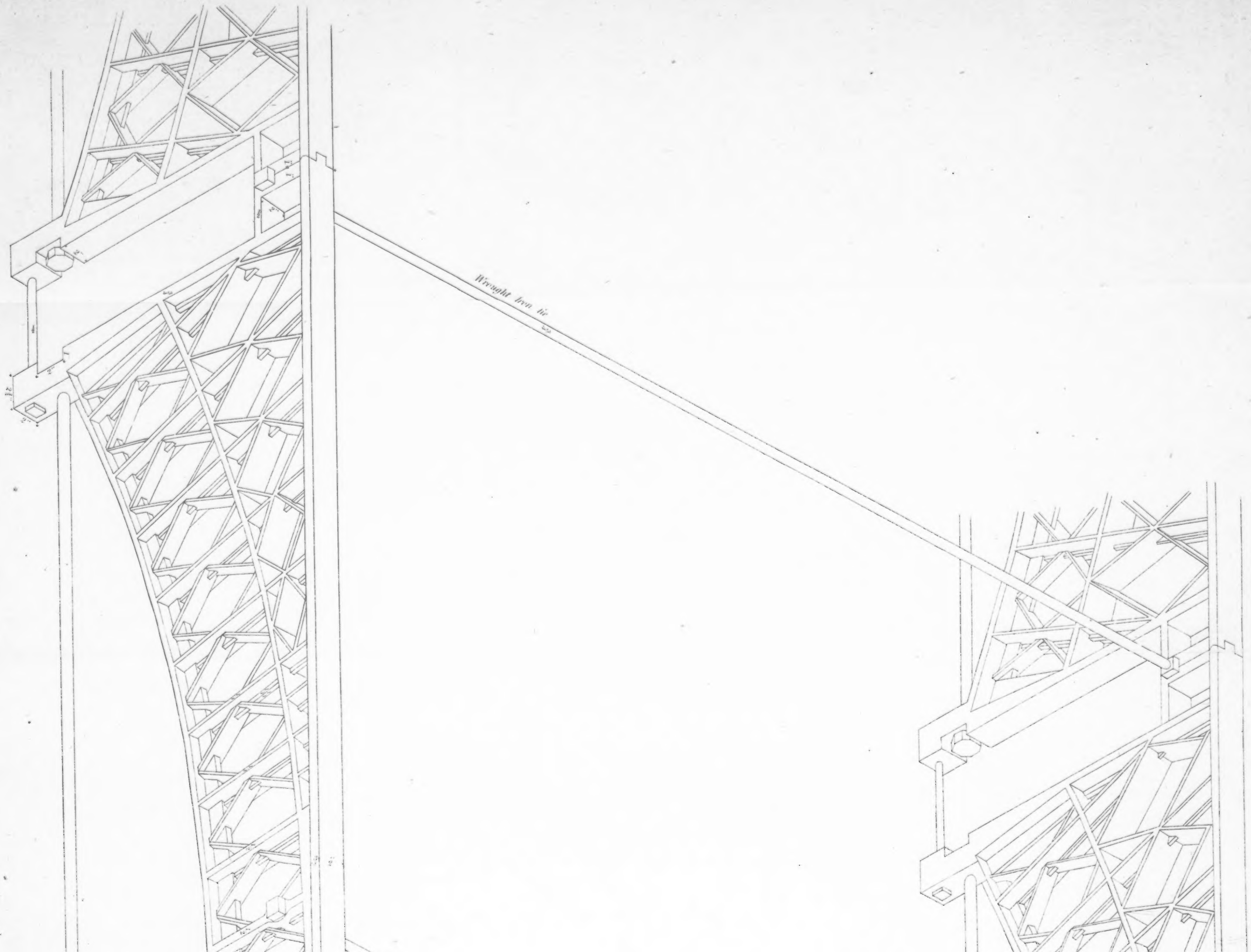
Wrought Iron tie

sound for use during a period of 10 years, and if kyanized on the plan recommended by Dr. Earle, and now used for preserving the bridge timber on the New York and Erie railroad, there is no doubt but what they will remain in a serviceable condition for an additional 40 years.

If greater durability be required, the piles may be sawed off below the surface of the soil, and cast iron heads dowelled upon them, thus securing their usefulness for centuries.

In crossing broad, sluggish streams, and also those of inconsiderable width, this superstructure of 10 feet spans, may be continued uninterruptedly, and much expense as well as time saved in the construction of bridges and culverts, which are rendered absolutely necessary by the use of any of the present plans of railroad superstructure. No inhabitant of our northern latitudes will overlook the advantages to be derived by the elevated position of the rail, as it completely secures the track from the inconvenience of snow.

In conclusion it may be remarked, that cast iron bars of the flat or common form, have been extensively used in England, in the construction of railways, and that their abandonment was caused by no inferiority of the metal, when contrasted with that of wrought iron for that purpose; but solely on the score of economy. In America, however, this cause operates differently, deciding for the employment of cast iron, which is moreover the only metal that can be used in the manufacture of this rail.

Further, it may be remarked, that all deductions and rules drawn from observations made on the flat or rectangular sectioned bar of cast iron, are totally inapplicable to this invention, differing as they do in their principles and governing laws, as completely as the arch and lintel, when compared, for spanning space.

It is almost superfluous to call your attention to the durability of this superstructure, executed without any wooden auxiliary, it will ever be free from the vexatious repairs, and consequent heavy expense, always attendant upon wooden constructions.

DESCRIPTION OF SPAULDING AND ISHERWOOD'S PLAN OF SUPERSTRUCTURE WITH CAST IRON RAIL.

The rail is to be of cast iron, 10 feet in length, 9 inches in depth at centre, and 1 foot 9 inches in depth at the extremities, with a general width of 2 inches. To be laid on a pile foundation.

The rail to be composed of an upper and lower arch, with appropriate flanges; the said arches to be connected by posts, with braces inserted lozengewise between them. The top of rail to be a horizontal bar, supported at intervals by the posts produced above the

upper arch, and by braces inserted lozengewise beneath it. The ends of the arches to terminate in a proper abutting piece, and their feet to be tied together with a wrought iron rod.

The rail to be cast in one piece with a tongue and groove joint at the extremities:—a cast iron chair to be placed on the heads of piles to support the joints of rails as shown in the accompanying plan.

The upper and lower arches to be parallel, 2 inches in breadth by ½ inch in depth, a flange 1½ inches deep by ½ inch broad at centre of rail, and ½ inch deep by ¼ inch broad at extremities of rail, to be placed beneath the upper arch. Also, a flange 1½ inches deep by ½ inch broad at the centre of rail, and 1 inch deep by ½ inch broad at the extremities of rail, to be placed upon the lower arch.

The posts connecting the upper and lower arches, and also filling the spandrels formed by the upper arch and bar at the top of rail, to be placed in lines of radii to the curve of the arches, at distance of 6 inches from centre to centre, on intrades of upper arch, and with the exception of the five centre posts are of the following description and size: 2 inches broad by ¼ inch thick, with a flange ¼ inch by ¼ inch, placed on both sides at the centre of the post. The five centre posts are 2 inches broad by ½ inch thick with similar flanges to the first mentioned posts; two of the centre posts are pierced by holes to receive the cross ties extending transversely between the rails.

The lozenge braces inserted in the spandrels are 2 inches broad by ¼ inch thick, those between the arches are 1 inch broad by ¼ inch thick.

The wrought iron ties, tying the feet of the arches together, are ¾ inch diameter. The wrought iron transverse ties are of the same diameter.

The horizontal bar forming the top of the rail is ¾ inch thick by 2¼ inches broad, with a descending flange of 1 inch in depth by ½ inch thick.

The piles to be grooved to receive the ends of rails, as shown in the *flange*. A screw bolt ½ inch diameter passes through the piles and connects the abutting pieces of adjacent rails.

These rails weigh 260 lbs. each. A number of them have been in use on the Ithaca and Owego railroad for the last three months, where twice daily they have been passed over by a locomotive engine weighing 11 tons, with heavy trains of freight, to the entire satisfaction of the superintendents and engineers of that railroad.

I. Spaulding,
B. F. Isherwood.

REPORT OF THE DIRECTORS OF THE BOSTON AND WORCESTER RAILROAD CORPORATION TO THE STOCKHOLDERS, June 7, 1841.

(Concluded.

Next to the Meteor in efficiency, we rank the Lion, which was built in England, and has been upon the road from February, 1836. This was one of the engines which was disabled on the 17th of June, by a concussion of such violence that no engine could be expected to resist it, and by which an engine of ordinary strength would have been demolished. She was put in the repair shop, and after a period of four months, came out restored to a condition apparently as good as before the accident. This engine is, with the exception of the Yankee, the oldest of the antiquated and decrepid machines which the corporation has in the passenger and freight service, yet she has run, in the course of eight months in the last twelve, 20,316 miles, with a cost of only $205 for repairs, exclusive of $1612 for her refit after the collision. In the course of four years previous to this accident, she had run with freight, and passenger trains, a distance of 76,250 miles.

The engines which class next in the amount of service performed, are the Mars and Vulcan, built by Mr. Norris, of Philadelphia. The Mars has been on the road twelve months, and has travelled 25,558 miles. The Vulcan, was placed on the road near the end of July, and in ten months has travelled 21,017 miles. The repairs of the Mars have amounted to $758, and of the Vulcan, to $533. They have generally travelled with freight trains. These two engines are of greater weight, have larger cylinders, consume more fuel, and are of greater power, than any others on the road, but they have small driving wheels, and the cylinders being placed outside of the wheels, at a distance from the centre of gravitation, they do not work so regularly when in swift motion, and are not so well adapted for rapid travelling, as the Meteor, Lion, Tartar, or Elephant, but in other respects they are well constructed, they are capable of throwing greater weight on their driving wheels, and are well adapted for freight engines, which do not require a rapid motion. These engines, it will be recollected, are of the pattern and fabric specially recommended by the committee, for their greater effiiency, and their liability to less cost for repairs. In the amount of repairs incurred by the several engines during the last year, with the exception of those which have been rendered necessary, by accidental concussions, entirely independent of the character of the engines, it will be perceived that there has been very little difference between those built by Mr. Norris and the older engines, though it might have been expected that there should be a decided difference in favor of the newest engines, especially if the old ones had been in a state of inefficient repair at the commencement of the year, as represented in the report of the committee.

Two other extremely efficient engines are the Tartar and Elephant, both built by Mr. Baldwin, of Philadelphia, one in April, 1837, and the other in August, 1839. The Tartar has travelled 22,818 miles in the last twelve months, and has cost for repairs

$800, and the Elephant in ten months has travelled 20,553 miles, with a cost for repairs of $420. The Tartar has been chiefly employed on the steamboat train, which duty she has performed with remarkable regularity, and rarely exceeding two hours in traversing the 45 miles from Boston to Worcester, with the heaviest trains. The William Penn, built by Mr. Baldwin in 1836, and the Lowell, built at Lowell in the same year, have both been in the repair shop during the greater part of the year, in consequence of the damages received on the 17th of June, but they are now both refitted, at an expense, the former of $2,315, and the latter of $1,296.

The Yankee, which the committee recommended specially should be discarded, is the oldest engine on the road, having been in use seven years. She was built in Boston, at the Mill-dam Foundry, and was the first locomotive built in New England. Notwithstanding the length of time she has been in service, she has travelled during the last twelve months, 13,926 miles, with a cost for repairs of $631.

The committee in their report, in alluding to the disabling of the three engines on the 17th of June, remark as follows: "By this disastrous day, the effective engines of the company are again reduced in number, while two of the survivors require heavy repairs, and another, the Yankee, should be at once discarded, and if a Norris engine of the second class had not opportunely arrived from Philadelphia, and proved competent to perform the duty of two freight engines, the business of the road would have been interrupted." The opportune arrival of this engine is spoken of as if it were entirely accidental, yet it was purchased by order of the directors in May, and was mentioned in the annual report of 1st of June. Its very purpose was, that it might supply the place of engines becoming unfit for regular service, and be a source of reliance in case of disaster to the engines in daily use. Although the directors did not anticipate the disabling of three of their best engines in one day, they were aware that some supernumerary force was expedient. Fortunately, the provision made by their foresight was fully adequate to the emergency.

The directors did not deem it expedient to comply with the recommendation of the committee to purchase six new engines, two to be of the larger class. They had, however, before the report was made, ordered one of the same class as the last before purchased, and this addition has rendered the locomotive force, thus far, fully adequate to all emergencies. Six of Norris's engines of the class recommended, would have cost, in conformity with the recommendation, a sum of near $40,000 beyond what, in the opinion of the directors, the wants of the corporation required; and much more than was warranted by any prospect of saving in repairs.

For the purpose, however, of being amply prepared for the contingency of an increase of freight, to arise from the further opening of the Western railroad, as well as the contingency of the accidental disabling of the engines now in use, the directors resolved, some months since, to add one more engine to their locomotive force, and a contract has been accordingly made for an engine of

larger class than either of those now in use, to be built at Lowell. It is anticipated that this engine will be received in a few weeks.

Some remarks were made in the last annual report, on the comparative advantages of a larger class of engines than those now in general use for the conveyance of freight. It is not necessary to repeat the observations there made. These engines are found to be of adequate power to convey the ordinary passenger trains at a regular speed of more than twenty miles an hour, and to convey such loads of freight as ordinarily offer, provided the trains are run as often as is required to satisfy the expectations of customers. There is a great convenience in having a portion of the engines, at least, adapted to the demands of both branches of the service. To adopt engines of a large class, like the eight-wheeled engines recommended by the committee, would subject us to the disadvantages of running often but partially loaded, and consequently involving a greater expense of fuel and repairs, of adopting a system which would afford the public less accommodation from frequent trains, and of having the road occupied in the conveyance of freight by engines entirely unsuitable to be substituted in place of the passenger engines, in case of an accidental failure. For these reasons, your directors are in no haste to discard the use of the present engines, even from the freight trains, so long as they continue to be adequate to the passenger service. Should experience indicate hereafter, that a different class of engines would be better adapted to the economical despatch of the business of the road, this change may be made gradually, as new engines shall be demanded, and by adopting in place of those which wear out, such others as experience may recommend as most likely to be useful.

In connection with the inefficiency of the locomotive department, the committee complain of the insufficiency of the freight depot accommodations. As a remedy for these inconveniences has been long under consideration, and as measures for an effectual remedy already described, are now in progress of execution, it is not necessary to dwell further on this topic. It may here be proper to remark, that the committee labored under a singular misapprehension in regard to the cost of loading and unloading goods. After speaking of the embarrassments to the convenient loading and unloading of goods, from the insufficiency of the accommodations, they remark, that "on the Lowell road, the entire expense of lading and unlading is about 23 cents per ton, while on the Worcester road, it varies from 64 to 75 cents per ton." It does not appear upon what authority the committee made this statement. The whole expenditure in the freight department in 1840, for labor, salaries of masters of transportation, and clerks in Boston and Worcester, and the other depots, as well as for losses and miscellaneous charges, amounted to $14,602. This whole cost, not half of which is for loading and unloading, averaged upon 31,739 tons, the quantity transported, amounts to 46 cents a ton. By a similar computation, it will be found that the expenses of 1838, for the same branch of service, amounted to 43 cents a ton, and that in no year has the cost of loading and unloading alone been more than a third part of the rate

stated by the committee, nor more than they state to be the cost on the Lowell road.

The committee proceed to argue in their report, at great length, that the second and principal cause of the deficiency of the revenue of the railroad is, that it "commands but a small portion of the business of the interior, in consequence of too high rates of freight." They go so far to maintain, "that it does not command one fifth part of the freight to which it is legitimately entitled," and the remedy which they propose, for this supposed desperate state of things, is to reduce the rates of freight about one half, and to prices considerably less than the actual cost of transportation.

The directors have not, of course, deemed it expedient to adopt the recommendation, and the reasons for it will be so easily understood, that they do not conceive it to be necessary to go into any lengthened argument in reply to that of the committee. They have satisfactory evidence that the railroad, instead of commanding only "one fifth part of the freight to which it is legitimately entitled," commands, in fact, much the greater part not only of the transportation upon the line of the road, but of all which can be advantageously brought upon it. If it were otherwise, to throw away the amount of net income now derived from freight, for the mere purpose of swelling the amount of business, which would be without profit, would be a most unwise policy. The present amount of freight exceeds 30,000 tons annually, and the profit derived from it affords an important part of the income of the road, and constitutes too important an interest to be sacrificed by any doubtful experiments.

The ground on which the committee justify the proposal to reduce the freight, to rates less than the present cost of transportation is, that that cost may be greatly reduced by the adoption of the improved engines which they recommend, and from the great increase of quantity which they predict would result from the proposed reduction. They go into a computation to prove the practicability of the reduction of cost. Their demonstration is more ingenious than satisfactory. The principal improvement in their plan of transportation, is to adopt, in place of the present engines, a single eight-wheeled engine, which shall be of sufficient power to transport all the freight by one daily trip, instead of two trips, which are required at present. For the service of this large engine, they allow only the same rate of cost for fuel, oil, repairs, etc., as would be required for an engine of the smallest class. Their computation is made also on the supposition that the engine will carry its full load of 133½ tons at every upward trip. But by far the most important saving which, by their method of computation, results from the adoption of a large engine is, that by means of a single freight trip a day, while there are four daily passenger trips, they would apportion *one fifth* only of the cost of road repairs and general expenses among the freight charges, and the other four fifths to the passenger department; whereas, if there are two daily freight trips, *two sixths* of the road repairs are apportioned to freight, and the other four sixths to passengers. As it is evident that what

would be saved in this way to the freight department, would be added to the expenses of the passenger department, it would afford a very unsatisfactory reason for an abatement in the charge of freight.

Although the directors have entertained no idea of a wholesale change like that proposed by the committee, they have uniformly regarded the proper and judicious adjustment of rates of freight, as an important and delicate question, and they have given to it a careful attention. In all investigations for determining the probability of increase of revenue by means of a reduction of the rates of freight, they have endeavored to inform themselves of the sources from which the increase was to be expected, the nature and amount of the increase, and the effect which the proposed change of rate would be likely to have on the aggregate of receipts. If the results of their inquiries should satisfy them of a reasonable prospect of an increase of net income, by any proposed change, or that such change would not diminish instead of increasing the profits of the corporation, they would not hesitate to make it: but until they can obtain that evidence, or an assurance of a greater revenue than at present, from some other source, they conceive that they would be violating their duty to the stockholders, by making any reduction of the present rates.

The income of the road for the year ending on the 31st of December last, as stated in the last annual report to the legislature, amounted to $267,547 41, and the expenditures to $140,441. The receipts of the last five months, from passengers and freight, have amounted to $107,464 47, which is about $14,000 more than the income from the same sources, of the correspending months of last year. The directors have ordered that in future the accounts preparatory to the declaration of dividends, shall be made up to the end of May and November, in each year. In conformity with this regulation, the first account for the present year has been made, embracing but five months, and a dividend of profits for these five months have been declared, of three per cent. on the capital stock, payable on the first Monday of July next.

Boston, June 7, 1841. NATHAN HALE, President.

Statement of the number of miles run by each of the Engines on the Passenger and Freight Trains, from June 1st, 1840, *to May* 31*st,* 1841, *with the date when each Engine was placed on the Road, and amount of repairs in each six months.*

Engine.	Built at	Put on the Road.	Miles run.	Repairs from July to Dec.	Repairs fm Jan. to May 31, & June 1840.	Repairs in 12 mos.
Yankee,	Boston,	June, 1834,	13,926	427,01	204,34	631,35
Lion,	Liverpool,	Feb. 1836,	20,316½	1612,11	204,75	8816,86
Wm. Penn,	Philadelphia,	March, 1836,	4,056†	680,95	1634,89	2315,84
Elephant,	do.	April, 1837,	20,553‡	320,90	89,91	420,81
Tartar,	do.	Aug. 1839,	22,818	174,37	605,60	799,97
Meteor,	Lowell,	Dec 1839,	29,721	415,63	201,38	617,01
Mars,	Philadelphia,	June, 1840,	25,558	373,47	384,61	758,08
Vulcan,	do.	July, 1840,	21,017‡	305,90	227,82	533,72
		Total.	157,965½			

The above statement of repairs embraces, in addition to the sums charged to each engine, an apportionment of the general expenses of the machine shop, for coal, tools, etc., so as to give, as nearly as is practicable, the whole cost of repairs on each.

*Eight months only on the road. †Seven months on the road.
‡Ten months on the road.

Cost of repairs of Engines and Cars, and miles travelled by Locomotives on the Boston and Worcester railroad, each year, from 1835 *to* 1840.

Years.	Repairs of Engines & Tenders.	Repairs of Freight Cars.	Repairs of Passenger Cars.	Total Repairs.	Miles run.
1835	$ 8,252	$1,157	$1,034	$10,443	82,049
1836	10,597	2,316	3,620	16,533	104,260
1837	11,441	5,016	3,600	20,057	115,564
1838	11,961	2,578	1,133	15,672	108,320
1839	16,222	4,342	5,634*	26,198	122,306
1840	10,816	1,422	4,429*	16,667	160,325

*Including a general refit of passenger cars.

Cost of Repairs of Engines, Tenders, and Passenger and Freight Cars, on the Providence, Lowell, and Worcester Railroads, for each of the last four years, according to the annual returns to the Legislature.

Years.	Boston and Lowell.	Boston and Providence.	Boston and Worcester.
1837	$16,633	$29,794	$20,053
1838	10,945	19,953	15,672
1839	16,384	19,466	26,198
1840	14,454	16,755	16,667

The Boston and Lowell road is 26 miles in length, the Boston and Providence 41, and the Boston and Worcester, 45.

Post Office Department and Railroads.—The editor of the Providence Journal, noticing the attempt to authorize the Postmaster General to establish mail lines along the great routes under certain circumstances, says:

"We think the mail might be carried from Washington to Providence, half the way by horses, at as little expense as is now incurred, and with infinitely greater convenience to the public. The Philadelphia and Baltimore railroad company, particularly, needs an overhauling. That company receives the highest compensation allowed by law, and transports the mails at such hours as suits its own convenience."

We regret that so liberal a gentleman as our brother of the Journal, should have thus done injustice to a company which serves the public.

The idea that the mail could be conveyed from Baltimore to Philadelphia by horses, in any thing like the time now occupied, is preposterous. It has been tried often enough, and resulted in complete failure. Besides, four horses cannot carry, on the turnpikes and roads, the heavy mails, at any thing like the speed usual with mail coaches.

But the company "need an overhauling." Why? The company is not a servant of the government; it was not aided by the government; it owes not its charter to the National government;

and, moreover, it has been most shamefully used by the servants of the government at different times. How then is it to be "overhauled?"

But the company received the "highest price allowed by law." Well, what of that? The law does not allow enough. If the government want more work done in less time, let it pay for it, not pass a mean screwing law, and condemn an independent company for not expending its means, and ruining its stock, to meet that law.

But the company, it seems, takes its own time, etc. The eastern mail arrives in Philadelphia about midnight, and is immediately conveyed forward to Baltimore by this company, at an hour most certainly inconvenient to itself, and most unpropitious to the reception of passengers. The same line starts a conveyance at 7 A. M., and at 3½ P. M., for Baltimore—choices of time, one would think. But perhaps, some other hours are also required. Very well; only let the government pay, and the company will start a line for each city every hour in the day. If the government will not *pay*, by what right can it look for a command of the road? This mean spirit, this attempt at tyranny, was set on foot by the late Postmaster General. It was promptly met by the company; and so, we trust, will every other attempt to use the strong arm of government against individual or corporate rights. The mail comes from Baltimore to Philadelphia quite rapidly enough. If, however, it does not come often enough, let the government pay for another conveyance. The postage collected from letters and papers on this route is immense, and the government can afford to pay for what they get. If the department, with a view of buying votes for the last election, erected and maintained profitless, nay, costly routes in the extremities, do not let it take the Baltimore, or any other company, to make up that deficiency.—*Phil. paper.*

Eeinent Success of Long Lines of Railroads.—London, 3d July, 1841. Longest lines of railroads, which are completed in England:

	Price of the Stock.	Length of Line.	Cost.
Grand Junction,	£202 for £100 paid	97¼ miles	£1,906 000
Great Western,	92 for 65 paid	118½ "	5,288 000
London and Birmingh'm,	159 for 90 paid	112½ "	5,724 000
Lon. and Southwestern,	55 for 38⅞ "	77 "	2,284 000

Receipts of said railroads for one week in July, 1841:—

Grand Junction,	- -	1 week, ending July	10,	£9,041
Great Western,	- -	1 " " "	11,	12,826
London and Birmingham,	-	1 " " "	10,	17,435
London and Southwestern,		1 " " "	12,	6,307

N. B. The Great Western is just completed. Its last 13 miles were opened 30th June, 1841.

Remarks by the Evening Gazette:—

The London and Southwestern railway and the Great Western, have been completed only a short time, and bid fair to give at least 10 per cent. per annum dividends.

The dividends of the Grand Junction railway are 13 per cent. per annum. Those of the Londen and Birmingham are 8 per cent. per annum; and in each of these roads the income is increasing, and a good reserve is kept, beyond the dividends.

Each road derives a great advantage from having loans at 5 per cent., which enables them to make a higher dividend on the stock than they could if the whole cost of the road was *capital.*

This is indeed wonderful success, when we consider the great cost of these roads, which, (reduced to dollars, at $4 80 per pound sterling,) is as follows:

Grand Junction,	- - - -	97¼ miles,	$9,148,000
Great Western,	- - - -	118½ "	25,332,000
London and Birmingham,	- - -	112½ "	27,475,000
London and Southwestern,	- -	77 "	10,790,000

In carrying on a long line of railroad there is a great saving in the fuel, in the expense of loading and unloading goods, and in the general expenses. And while these expenses are less than in proportion to the length of the road, the tributary sources right and left of the road, and at each end of it, increase as the square of the distance, as may be seen by a moment's reflection, or by drawing a diagram on paper. Thus, (other things being equal,) *a railroad of 200 miles will have four times as many tributary sources as a railroad of 100 miles.*

Long lines of Railroad.—If a railroad 220 miles long attracted to itself tributary sources from a strip of country (right and left of it, and at each end of it,) of *precisely the same width*, as would a railroad 100 miles long,—the consequence would be, (other things being equal,) that the *tributary sources of income* of a railroad, 220 miles long, *would be double* those of a railroad 100 miles long.

But it is evident that, as you increase the length of the railroad, *you also increase its power of attraction*, and extend this power of attraction over a greater width:—say, for instance, a passenger living 30 miles, at right angles from the railroad, and desiring to go 100 miles from home on the railroad, may yet find it best to go the direct route of 100 miles on the common road, instead of the 130 miles (composed of 30 miles of common road and 100 miles of railroad.) But if the same man, living 30 miles at right angles from the railroad, desires to go 200 miles on the railroad, he will, at once, decide that it is better for him to travel 230 miles, (viz. 30 miles of common road and 200 miles on the railroad,) than to go 200 miles, by the old road direct.

Following up this course of reasoning, we readily arrive at the conclusion, *that the strip of country, attracted by a railroad, 200 miles long, is twice as wide* as the strip of country attracted by a railroad 100 miles long. This strip of country, attracted to the railroad, being thus *twice as wide*, as well as *twice as long*, it follows mathematically, (other things being equal,) that *the tributary sources of income* to the railroad of 200 miles, will be *four times as great* as those to the railroad of 100 miles.

It need not be suggested that the demonstration above given applies to freight precisely as well as it does to passengers.

Hence the pre-eminent success and *good dividends* of the *long lines of railroads* completed in England, notwithstanding their enormous cost.—*Boston Atlas.*

The Western Railroad.—Some of the papers speak of the depot building of the Western railroad on the South Cove. The Western railroad begins at Worcester and extends to the western line of the State, and including the Albany and West Stockbridge railroad, which it is building under a lease from the stockholders, it will extend to the Hudson river in Albany, with a depot in that city. But it comes no nearer Boston than Worcester, and of course has no depot in this city. The Boston and Worcester railroad, which forms the eastern portion of the line of communication from Boston to the west, furnishes the necessary depot buildings in this city. This company has lately enlarged its passenger depot building, which is now 290 feet in length, and 51 and 60 feet in breadth. There are besides the adjoining spacious buildings for housing of passenger cars. The company are now building, in addition to the former accommodations for the freight business, a freight house, 465 feet in length and 120 feet in breadth, covering the entire square between Lincoln, Utica, Eliot and Harvard streets, to consist of platforms on the two sides, level with the floor of the cars, and of four railway tracks in the immediate space. They have completed the laying of twelve miles of the second track of the railroad, and will complete the laying of eight miles more before winter.—*Daily Adv.*

Statistics of Railroads.—The following from the Boston Transcript should admonish the stockholders of the Harlem railroad company, to make one concern with the New York and Albany railroad. *Short roads*, with their extra expenses of management, etc., will generally preclude dividends, while *long roads*, between desirable points, are sure of success. Certain it is, from the course pursued by both companies, our capitalists will not take up either, in the desired manner, whilst Boston "is heading us off" in our western trade at Albany.

The New York and Albany railroad, we understand, have the power to construct a railroad, on this island, to the business part of the East River, "with the consent of the corporation." If the bona fide stockholders of the Harlem railroad should not come into an equitable arrangement, we trust our Common Council, capitalists and landholders, will take the matter in hand, so that a good *permanent railroad* may be commenced at the north, the south, and in the centre, without further delay. We understand the country are still ready to do their part, although they begin to think they have been trifled with by conflicting interests. Manhattan.

Steam Engine.—We saw yesterday in the store of Dr. Sutton, in Third street above Branch, an application of steam which seems so very direct and simple, as to be worthy the regard of the curious in such matters. A very small boiler sent four streams of steam,

the aggregate of which was less than one-eighth of an inch in thickness, into the nave of a wheel, whence it passed by the felloes out at the periphery, giving rapid motion to the wheel, which, by bands, is communicated to machinery. We do not know that the main principle is entirely new: certainly, however, the whole is remarkable for simplicity and effect.—*Macon Telegraph.*

Utica and Schenectada Railroad.—The Schenectada Reflector says—"This road commenced operations with the month of August, 1836, frem which time up to the 1st of August, 1841, making a period of five years. Within that time the company's locomotive engines have made about 1,870 trips across the road annually, or in other words, have run on an average, about 150,000 miles a year, and within the period of five years, 750,000 miles. Within the same period they have carried 434,893 passengers over the whole length of their road, and 376,695 between intermediate points; making, in the aggregate, 811,589 passengers who have been transported on that road within five years. Within this five years, during which 811,589 passengers have been conveyed on that road, no accident, (with but one exception, in 1836, when two passengers were slightly hurt,) has ever occurred, by which any passenger was injured; and no serious injury, with but one exception, has ever occurred to any of the men employed on the engines or train. Within the same period of five years, during which the locomotive engines have made, on an average, 1,870 trips annually, they have never failed to make any one trip, have never but once been six hours behind their time, and, with four or five exceptions, have never been three hours behind their time, although snows have covered the track three feet deep, and floods have carried off, and fire burnt up bridges. There is no line of public conveyance on the face of the globe, not even excepting the Hudson river steamboats, that can show a greater degree of regularity, puntuality and safety, in the transportation of so great a number of passengers, than the Utica and Schenectada railroad, and certainly no railroad that can at all compete with it. This most complete and gratifying success is owing to the care, attention, and skill of Wm. C. Young, superintendent and engineer, and of David Mathews, superintendent of the motive power on that road."

Railroad speed.—An instance of the amazing rapidity with which communication can now be effected, through the medium of railroads, was afforded recently in England. A special train was despatched from Birmingham to London, on election business, at 12 P. M., (calling in its course at seven intermediate stations, and suffering delay altogether of fourteen minutes,) and arrived at Easton station at eleven minutes past three A. M., thus performing the distance of 112½ miles, exclusive of stoppages, in two hours and fifty-seven minutes!